

Application No. 09/921,851
Amendment dated July 17, 2006
Reply to Office Action of February 16, 2006

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claims 1-125 (cancelled).

126. (previously presented) A method for forming an interbody spinal implant having an exterior surface with a plurality of bone engaging structures for insertion between adjacent vertebral bodies of a human spine, the method comprising the steps of:

providing the implant comprising a leading end for introduction of the spinal implant into the spine, an opposite trailing end, spaced apart sides therebetween, and a mid-longitudinal axis passing through the leading and trailing ends, opposite upper and lower surfaces between said leading and trailing ends and said spaced apart sides, said upper surface adapted for placement toward the bone of one of the vertebral bodies and said opposite lower surface adapted for placement toward the bone of the other of the vertebral bodies when the implant is placed between the adjacent vertebral bodies; and

forming surface projections as part of the upper and lower surfaces of the implant:

at least a first and second of said surface projections each having a first facet configuration with at least one forward facet directed at least in part toward the leading end and at least one rearward facet directed at least in part toward the trailing end, said forward facet and said rearward facet having a length and a slope, the length of said forward facet being longer than the length of said rearward facet, the slope of said rearward facet being steeper than the slope of said forward facet, said first and second surface projections having opposed side facets between said forward facet and said rearward facet, said side facets

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having at least a first portion in a plane passing through and being at an angle to the mid-longitudinal axis of the implant, said first and second surface projections each having a peak along a first line that is transverse to the mid-longitudinal axis of said implant; and

at least a third and fourth of said surface projections each having a second facet configuration with at least one forward facet directed at least in part toward the leading end and at least one rearward facet directed at least in part toward the trailing end, said forward facet and said rearward facet of said second facet configuration having a length and a slope, the length of said forward facet of said second facet configuration being longer than the length of said rearward facet of said second facet configuration, the slope of said rearward facet of said second facet configuration being steeper than the slope of said forward facet of said second facet configuration, said third and fourth surface projections each having a peak along a second line that is transverse to the mid-longitudinal axis and off-set from the first line transverse to the mid-longitudinal axis, the second facet configuration of the third and fourth surface projections being different from the first facet configuration of the first and second surface projections.

127. (previously presented) The method of claim 126, wherein the step of forming includes one of the sub-steps of grinding, milling, burning, lasering, burnishing, electric discharge machining, broaching, and machining to form said surface projections.
128. (previously presented) The method of claim 126, wherein the steps of providing and forming include the sub-step of casting to form said implant with said surface projections.
129. (previously presented) The method of claim 126, wherein said forming step includes the sub-step of orienting said projections relative to one another to form an array.
130. (previously presented) The method of claim 126, wherein said forming step includes the sub-step of orienting said projections to be geometrically disposed

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relative to one another.

Claims 131-206 (cancelled).

207. (previously presented) The method of claim 126, wherein the step of providing the implant includes providing an implant having at least one opening in each of the upper and lower surfaces in communication with one another, the openings being configured to permit for the growth of bone from vertebral body to adjacent vertebral body through the implant.
208. (previously presented) The method of claim 207, further comprising the step of combining the implant with at least one of harvested bone, bone morphogenetic proteins, hydroxyapatite, and genes coding for the production of bone.
209. (previously presented) The method of claim 207, wherein the step of providing the implant includes providing an implant having an internal chamber between the upper and lower surfaces and in communication with the at least one opening in each of the upper and lower surfaces, the internal chamber being adapted to contain bone growth promoting materials.
210. (previously presented) The method of claim 209, further comprising the step of combining the implant with at least one of harvested bone, bone morphogenetic proteins, hydroxyapatite, and genes coding for the production of bone.

Claims 211-212 (cancelled).

213. (previously presented) The method of claim 126, wherein the step of forming the plurality of surface projections includes using a milling instrument.
214. (previously presented) A method for forming an interbody spinal implant having an exterior surface with a plurality of bone engaging structures for insertion between adjacent vertebral bodies of a human spine, the method comprising the steps of:

providing the implant comprising a leading end for introduction of the spinal implant into the spine, an opposite trailing end, spaced apart sides therebetween, and a mid-longitudinal axis passing through the leading and trailing ends, opposite upper and lower surfaces between said leading and

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trailing ends and said spaced apart sides, said upper surface adapted for placement toward the bone of one of the vertebral bodies and said opposite lower surface adapted for placement toward the bone of the other of the vertebral bodies when the implant is placed between the adjacent vertebral bodies; and

forming surface projections as part of the upper and lower surfaces of the implant with a milling instrument, at least two of said surface projections each having at least one forward facet directed at least in part toward the leading end and at least one rearward facet directed at least in part toward the trailing end, said forward facet and said rearward facet having a length and a slope, the length of said forward facet being longer than the length of said rearward facet, the slope of said rearward facet being steeper than the slope of said forward facet, said at least two of said surface projections having opposed side facets between said forward facet and said rearward facet, said side facets having at least a first portion in a plane passing through and being at an angle to the mid-longitudinal axis of the implant, said forward facets of said at least two of said surface projections facing the same direction, wherein the milling instrument includes a cutting tool with a V-shaped profile.

215. (previously presented) The method of claim 214, wherein the step of providing the implant includes providing an implant having at least one opening in each of the upper and lower surfaces in communication with one another, the openings being configured to permit for the growth of bone from vertebral body to adjacent vertebral body through the implant.
216. (previously presented) The method of claim 215, further comprising the step of combining the implant with at least one of harvested bone, bone morphogenetic proteins, hydroxyapatite, and genes coding for the production of bone.
217. (previously presented) The method of claim 215, wherein the step of providing the implant includes providing an implant having an internal chamber between the upper and lower surfaces and in communication with the at least one

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- opening in each of the upper and lower surfaces, the internal chamber being adapted to contain bone growth promoting materials.
218. (previously presented) The method of claim 217, further comprising the step of combining the implant with at least one of harvested bone, bone morphogenetic proteins, hydroxyapatite, and genes coding for the production of bone.
219. (previously presented) The method of claim 214, wherein the forming step includes the sub-step of orienting said projections relative to one another to form an array.
220. (previously presented) The method of claim 214, wherein the forming step includes the sub-step of orienting said projections to be geometrically disposed relative to one another.
221. (currently amended) A method for forming an interbody spinal implant having a plurality of bone engaging structures for insertion between adjacent vertebral bodies of a human spine, the method comprising the steps of:
- providing the implant comprising a leading end for introduction of the spinal implant into the spine, an opposite trailing end, and spaced apart sides therebetween, a mid-longitudinal axis through the leading and trailing ends, and opposite upper and lower surfaces between said leading and trailing ends and said spaced apart sides, said upper surface adapted for placement toward the bone of one of the vertebral bodies and said opposite lower surface adapted for placement toward the bone of the other of the vertebral bodies when said implant is placed between the adjacent vertebral bodies; and
- forming a plurality of surface projections as part of the upper and lower surfaces of the implant, each of the surface projections having a base with a length and a width, each of the surface projections having a height perpendicular to the length and the width, at least two of the surface projections each having at least one forward facet directed at least in part toward the leading end and at least one rearward facet directed at least in part toward the trailing end, said rearward facet terminating at a first location proximate the base, said rearward

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facet terminating at a second location proximate said forward facing facet, the first location being closer than the second location to a vertical plane transverse to the mid-longitudinal axis, representing the furthest distal extent of the leading end of the implant than the second location, each of said at least two surface projections being formed to have opposed side facets extending from the base and being directed generally toward said spaced apart sides of the implant, respectively, said side facets converging toward one another between said forward facet and said rearward facet of each of said at least two surface projections, the width of the base of each of said at least two surface projections being greater than the respective height of each of said at least two surface projections.

222. (previously presented) The method of claim 221, wherein the step of forming includes one of the sub-steps of grinding, milling, burning, lasering, burnishing, electric discharge machining, and broaching to form said surface projections.
223. (previously presented) The method of claim 221, wherein the steps of providing and forming include the sub-step of casting to form said implant with said surface projections.
224. (previously presented) The method of claim 221, wherein said forming step includes the sub-step of orienting said projections relative to one another to form an array.
225. (previously presented) The method of claim 221, wherein said forming step includes the sub-step of orienting said projections to be geometrically disposed relative to one another.

Claim 226 (cancelled).

227. (previously presented) The method of claim 221, wherein the step of forming includes forming the forward facets of at least two of said at least two surface projections to face the same direction.

Claim 228 (cancelled).

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229. (previously presented) The method of claim 221, wherein the step of forming includes forming said at least two surface projections to have substantially the same maximum height from the surface of said implant.
230. (previously presented) The method of claim 221, wherein the step of providing the implant includes providing an implant having at least one opening in each of the upper and lower surfaces in communication with one another, the openings being configured to permit for the growth of bone from vertebral body to adjacent vertebral body through the implant.
231. (previously presented) The method of claim 230, further comprising the step of combining the implant with at least one of harvested bone, bone morphogenetic proteins, hydroxyapatite, and genes coding for the production of bone.
232. (previously presented) The method of claim 230, wherein the step of providing the implant includes providing an implant having an internal chamber between the upper and lower surfaces and in communication with the at least one opening in each of the upper and lower surfaces, the internal chamber being adapted to contain bone growth promoting materials.
233. (previously presented) The method of claim 232, further comprising the step of combining the implant with at least one of harvested bone, bone morphogenetic proteins, hydroxyapatite, and genes coding for the production of bone.
234. (previously presented) The method of claim 221, wherein the step of forming the plurality of surface projections includes using a milling instrument.
235. (previously presented) The method of claim 234, wherein the milling instrument includes a cutting tool with a V-shaped profile.
236. (previously presented) The method of claim 126, wherein at least a fifth and sixth of said surface projections formed during the step of forming each have a third facet configuration with at least one forward facet directed at least in part toward the leading end and at least one rearward facet directed at least in part toward the trailing end, said forward facet and said rearward facet of said third facet configuration having a length and a slope, the length of said forward facet of said

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third facet configuration being longer than the length of said rearward facet of said third facet configuration, the slope of said rearward facet of said third facet configuration being steeper than the slope of said forward facet of said third facet configuration, said fifth and sixth surface projections each having a peak along a third line that is transverse to the mid-longitudinal axis and off-set from the first and second lines, the third facet configuration of the fifth and sixth surface projections being different from the first facet configuration of the first and second surface projections and the second facet configuration of the third and fourth surface projections.

237. (previously presented) The method of claim 126, wherein the step of forming includes forming said forward facets of said first and second surface projections to face the same direction.
238. (previously presented) The method of claim 126, wherein the step of forming includes forming at least one of the surface projections along the first line to have a maximum height from the surface of the implant that is substantially the same as the maximum height of one of the surface projections along the second line.
239. (previously presented) The method of claim 126, wherein the step of forming includes forming at least three surface projections having the first facet configuration along the first line and forming at least three surface projections having the second facet configuration along the second line.
240. (previously presented) The method of claim 126, wherein the step of forming includes forming at least four surface projections having the first facet configuration along the first line and forming at least four surface projections having the second facet configuration along the second line.
241. (previously presented) The method of claim 126, wherein the step of forming includes forming at least five surface projections having the first facet configuration along the first line and forming at least five surface projections having the second facet configuration along the second line.

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242. (previously presented) A method for forming an interbody spinal implant having an exterior surface with a plurality of bone engaging structures for insertion between adjacent vertebral bodies of a human spine, the method comprising the steps of:

providing the implant comprising a leading end for introduction of the spinal implant into the spine, an opposite trailing end, spaced apart sides therebetween, and a mid-longitudinal axis passing through the leading and trailing ends, opposite upper and lower surfaces between said leading and trailing ends and said spaced apart sides, said upper surface adapted for placement toward the bone of one of the vertebral bodies and said opposite lower surface adapted for placement toward the bone of the other of the vertebral bodies when the implant is placed between the adjacent vertebral bodies; and

forming surface projections as part of the upper and lower surfaces of the implant:

at least a first and second of said surface projections each having a first facet configuration with at least one forward facet directed at least in part toward the leading end and at least one rearward facet directed at least in part toward the trailing end, said forward facet and said rearward facet having a length and a slope, the length of said forward facet being longer than the length of said rearward facet, the slope of said rearward facet being steeper than the slope of said forward facet, said first and second surface projections each having a peak along a first line that is transverse to the mid-longitudinal axis of said implant; and

at least a third and fourth of said surface projections each having a second facet configuration with at least one forward facet directed at least in part toward the leading end and at least one rearward facet directed at least in part toward the trailing end, said forward facet and said rearward facet of said second facet configuration having a length and a slope, the length of said forward facet

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of said second facet configuration being longer than the length of said rearward facet of said second facet configuration, the slope of said rearward facet of said second facet configuration being steeper than the slope of said forward facet of said second facet configuration, said third and fourth surface projections each having a peak along a second line that is transverse to the mid-longitudinal axis and off-set from the first line transverse to the mid-longitudinal axis, the second facet configuration of the third and fourth surface projections being different from the first facet configuration of the first and second surface projections.

243. (previously presented) The method of claim 242, wherein the step of forming includes one of the sub-steps of grinding, milling, burning, lasering, burnishing, electric discharge machining, broaching, and machining to form said surface projections.
244. (previously presented) The method of claim 242, wherein the steps of providing and forming include the sub-step of casting to form said implant with said surface projections.
245. (previously presented) The method of claim 242, wherein the forming step includes the sub-step of orienting said projections relative to one another to form an array.
246. (previously presented) The method of claim 242, wherein the forming step includes the sub-step of orienting said projections to be geometrically disposed relative to one another.
247. (previously presented) The method of claim 242, wherein the step of providing the implant includes providing an implant having at least one opening in each of the upper and lower surfaces in communication with one another, the openings being configured to permit for the growth of bone from vertebral body to adjacent vertebral body through the implant.
248. (previously presented) The method of claim 247, further comprising the step of combining the implant with at least one of harvested bone, bone morphogenetic proteins, hydroxyapatite, and genes coding for the production of bone.

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249. (previously presented) The method of claim 247, wherein the step of providing the implant includes providing an implant having an internal chamber between the upper and lower surfaces and in communication with the at least one opening in each of the upper and lower surfaces, the internal chamber being adapted to contain bone growth promoting materials.
250. (previously presented) The method of claim 249, further comprising the step of combining the implant with at least one of harvested bone, bone morphogenetic proteins, hydroxyapatite, and genes coding for the production of bone.
251. (previously presented) The method of claim 242, wherein the step of forming the plurality of surface projections includes using a milling instrument.
252. (previously presented) The method of claim 242, wherein at least a fifth and sixth of said surface projections formed during the step of forming each have a third facet configuration with at least one forward facet directed at least in part toward the leading end and at least one rearward facet directed at least in part toward the trailing end, said forward facet and said rearward facet of said third facet configuration having a length and a slope, the length of said forward facet of said third facet configuration being longer than the length of said rearward facet of said third facet configuration, the slope of said rearward facet of said third facet configuration being steeper than the slope of said forward facet of said third facet configuration, said fifth and sixth surface projections each having a peak along a third line that is transverse to the mid-longitudinal axis and off-set from the first and second lines, the third facet configuration of the fifth and sixth surface projections being different from the first facet configuration of the first and second surface projections and the second facet configuration of the third and fourth surface projections.
253. (previously presented) The method of claim 242, wherein the step of forming includes forming said forward facets of said first and second surface projections to face the same direction.

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254. (previously presented) The method of claim 242, wherein the step of forming includes forming at least one of the surface projections along the first line to have a maximum height from the surface of the implant that is substantially the same as the maximum height of one of the surface projections along the second line.
255. (previously presented) The method of claim 242, wherein the step of forming includes forming at least three surface projections having the first facet configuration along the first line and forming at least three surface projections having the second facet configuration along the second line.
256. (previously presented) The method of claim 242, wherein the step of forming includes forming at least four surface projections having the first facet configuration along the first line and forming at least four surface projections having the second facet configuration along the second line.
257. (previously presented) The method of claim 242, wherein the step of forming includes forming at least five surface projections having the first facet configuration along the first line and forming at least five surface projections having the second facet configuration along the second line.
258. (previously presented) The method of claim 221, wherein said forward facet and said rearward facet have a length and a slope, the step of forming including forming the length of said forward facet to be longer than the length of said rearward facet, and forming the slope of said rearward facet to be steeper than the slope of said forward facet.
259. (previously presented) The method of claim 221, wherein the step of providing includes providing the implant with a width and a height, the width being greater than the height.
260. (previously presented) The method of claim 221, wherein the step of forming includes forming each of the forward facet, the rearward facet, and the opposed side facets to be in the shape of a triangle.

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- 261. (previously presented) The method of claim 221, wherein the step of forming includes forming the forward facet to be in the shape of an isosceles triangle.
- 262. (previously presented) The method of claim 221, wherein the step of providing includes providing the implant so that the upper and lower surfaces each include a plurality of openings to permit bone growth from adjacent vertebral body to adjacent vertebral body through the implant.